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RESPONSE OF CUCUMBER *(CUCUMIS SATIVUS* L.*)* TO DIFFERENT RATES OF GOAT AND POULTRY MANURE ON AN ULTISOL

IKEH, A. O*., UDOH, E. I., UDUAK, G. I***, UDOUNANG, P. I****., ETOKEREN U. E*****
***Department of Crop Science, University of Uyo, Uyo, Akwa Ibom State, Nigeria**
****Department of Crop Science, Akwa Ibom State University**
*****Department of Soil Science, Akwa Ibom State University**
******Department of Farm Services, Akwa Ibom State University**
*******Department of Agriculture, Akwa Ibom State School of Arts and Science**
Phone Number: +234(0)8033934217
E-mail: iykeh2007@yahoo.com

ABSTRACT
The growth and yield of cucumber (Cucumus sativus L.) in response to application of goat dung and poultry dropping rates was investigated in 2010 and 2011. The experiment was laid out in randomized complete block design replicated three times in a split plot arrangement. The main plot treatment was organic manure source (goat dung and poultry dropping) while organic manure rate, 0, 2, 4, 6 and 8t/ha constituted the sub-treatments. Results revealed that organic manure application would enhance growth and yield of cucumber. There was no significantly ($p<0.05$) different between application of goat dung and poultry dropping on growth and yield parameters except on leaf area. The result also showed significantly ($p<0.05$) different among the manure rates irrespective of manure source. Application of poultry dropping performed best in fresh fruit yield 7.66 and 7.73t/ha in 2010 and 2011 respectively while goat dung produced 6.81 and 6.82t/ha in 2010 and 2011 respectively. The application of 8t/ha of poultry manure produced fresh fruits of 11.25 and 11.29t/ha in 2010 and 2011 respectively while goat dung at 8t/ha rate produced 9.53 and 9.69t/ha of fresh fruit in 2010 and 2011 respectively.

Keywords: *Cucumber, Poultry Manure, Goat Manure*

INTRODUCTION

Sustainable crop production demands the use of organic manure. The organic matter content of soils is one of the keys to their productivity. Before inorganic fertilizers were known. The major practice in soil fertility improvement centred on the application of manure to the soil. According to Udoh *et al.,* (2005) and FAO (2000) the principle that makes organic manure useful and important in soil fertility maintenance is their impact on soil fertility supplies, moisture holding capacity and structural characteristic. The organic matter benefit the soil through; binding the soil particles together to form aggregates, improving the moisture – holding capacity of soil (especially in sandy and loamy soils), improving soil permeability to water, increasing the cation exchange capacity of soils, buttering the soil against excessive or abrupt pH change when soil amendments are added, favouring the formation of metal-organic matter complexes (e.g. with the Fe, Mn, Cu, Zn) which enhances the stable availability of these micronutrients throughout the growing period. Organic nutrients are important source of the micronutrients and also some secondary nutrients (S, Mg, Fe, Cu).

Cucumber *(Cucumis sativus L.)* is an ancient vegetable and one of the most important members of the *Cucubitaceae* family (Thoa, 1998; Eifediyi and Remison, 2009) that is cultivated for its fruits which are a rich source of minerals and vitamins. The fruit is eaten fresh in salads in accompaniment with other vegetables (Eifediyi and Remison, 2009). The soils where cucumber is cultivated require moderate to high nutrient levels so as to achieve

high yields. Infertile soils result in bitter and misshapen fruits which are often rejected by consumer thereby reducing farmer's income (Eifeyidi and Remison, 2009). Recently, cucumber entered the farming system of Akwa Ibom State, farmer cultivate cucumber mainly as sole crop in the flood plains and lowland soils (Udo and Ibia, 2009). One of the major problem cucumber farmers faces in the study area is inadequate information on alternative to scarce and high cost of mineral fertilizer.

Apart from the enormous manure production in livestock farming and processing, very little of available manure is utilized in crop production. Macreke *et al.,* (2001) in Tanzania had observed that only one percent of farmers in Tanzania apply animal manures and this was attributed to lack of scientific basis for advising farmers on application rates. It is also observed that information is scarce on response of cucumber (*Cucumis sativus L.)* to different source of animal manure. Against this background, there is need to study the effect of different organic manure source and rates in cucumber. With view of making appropriate recommendation(s) to cucumber farmers in Uyo agro-ecology.

MATERIALS AND METHODS

The experiment was conducted at the University of Uyo Teaching and Research Farm, Use-Offot Uyo, Akwa Ibom State of Nigeria. The site is located at Latitude $5^0 17^I$ and $5^0 27^I$N, Longitude $7^0 27^I$ and $7^0 58^I$E and on altitude of 38.1m above sea level. This rainforest zone receives about 2500mm rainfall annually. The rainfall pattern is bimodal, with long (March - July) and short (September – November) rainy seasons separated by a short dry spell of uncertain length usually during the month of August. The mean relative humidity is 78% and the atmospheric temperature is 30^0C. The mean sunshine hours is 12 (Peters *et al*, 1989).

The experimental site was cleared of existing vegetation and packing of debris was carried out before it was marked into plots. The experiment was laid out in a randomized complete block design (RCBC) replicated three times in split plot arrangement. The main plot size was 15 x 3m ($45m^2$) while sub-plot size 3 x 3m ($9m^2$). Each plot was separated from the others by 2m paths. The variety of cucumber used was Ashley. It was obtained from National Horticultural Research Institute (sub-station) Mbato, Okigwe – Imo State, Nigeria. Planting was done on 19th and 28 April, 2010 and 2011 respectively. Two (2) seeds of cucumber were sown per hole at a spacing of 75cm x 75cm.

Organic manure (poultry dropping and goat dung) were obtained from Department of Animal Science (Poultry and Goat Unit) University of Uyo, Akwa Ibom State. The laboratory analysis of soil, poultry dropping and goat dung in 2010 and 2011 is presented in Table 1. The organic manures were applied according to treatments two weeks before sowing. The main treatment were; goat dung and poultry dropping while organic manure rates; control, 2, 4, 6, and 8t/ha constituted the sub-treatment. Weeding was done manually at 3, 6 and 9 weeks after sowing. The crops were sprayed with lamdacyahalothrin as "Karate" (insecticide) at the rates of 2 litres at 3 and 6 weeks after sowing. Also benomyl (benlate) fungicide at 1.5kg/ha was sprayed at 4, 6 and 8 weeks after sowing to protect the crops against fungal diseases.

Harvesting of the cucumber fruits commenced at seven (7) weeks after sowing when the fruits had turn deep green in colour. Harvesting was done by handpicking of the matured fruits weekly. The following growth and yield data were collected; vine length, number of leaves, leaf area at 3, 6 and 9 weeks after sowing (WAS), while number of fruits per plant, fruit length, circumference and fresh fruit yield (t/ha) were determined at harvest. All data collected were subjected to analysis of variance. The means that shows significant difference were separated with least significant difference at 5% probability level.

RESULTS AND DISCUSSION

The effect of poultry dropping and goat dung application showed significant difference in vine length at 9 weeks after sowing (WAS) in 2010 and 2011 respectively (Table 2). The range of vine length in poultry manure treatment at 3-9 weeks after sowing (WAS) was 23.23 to 171.34cm and 25.14 to 219.94cm in 2010 and 2011 respectively. The result showed no significant difference between goat and poultry manure at 3 and 6 WAS in 2010 and 2011 respectively, although poultry manure had little edge over goat manure in both planting seasons. The result also showed that any increase in the goat dung and poultry dropping rate from 0-8t/ha resulted in significant increase in vine length. Both organic manure (goat and poultry) produced longest vine at application of 8t/ha rate. The control (no manure) produced the shortest vine in both planting seasons. The interaction effect between manure source and rate on vine length significant ($p<0.05$) only at 9 WAS in 2010 and 2011 respectively. The number of leaves per plant as influenced by goat dung and poultry dropping rates showed that the number of leaves gradually increase from 3 to 9 WAS (Table 3). Goat dung produced 4.95, 18.23 and 29.58 number of leaves in 2010 and 5.56, 19.36 and 31.17 number of functioning leaves per plant in 2011 respectively. Poultry dropping application produced number of leaves 4.99, 19.98 and 31.28 at 3, 6 and 9 weeks after sowing in 2010 respectively and 5.92, 22.04 and 33.08 at 3, 6 and 9 WAS in 2011 respectively. In both planting season the result showed no significant difference ($p<0.05$) between the two organic manure at 3, 6 and 9 WAS. At 6 and 9 WAS any increase in the goat and poultry dropping rate led to significant increase in number of functional leaves per plant. The application of 8t/ha of goat and poultry manure in both planting seasons produced highest number of functional leaves per plant.

The control treatment produced the least number of functional leaves per plant. The interaction between manure source and rate showed no significant difference at 3, 6 and 9 WAS in both planting seasons. The leaf area as affected by varying goat and poultry dropping at 3, 6 and 9 WAS showed significant difference, ($p<0.05$) (Table 4). The result showed that poultry dropping produced widest leaves, 1103.19, 3600.70 and 4053.00cm^2 in 2010, 1049.16, 3638.17 and 4198.00cm^2 in 2011 at 3, 6 and 9 WAS respectively. The goat dung produced least area 984.91, 3394.37 and 4039.59cm^2 in 2010 and 1016.71, 3553.75 and 3856.39cm^2 in 2011 at 3, 6 and 9 WAS respectively. The result further showed significant ($p<0.05$) increase in leaf size with increase in goat and poultry dropping rates in both planting seasons of 8t/ha produced widest leaves at 3, 6 and 9 WAS in both organic manure and planting seasons followed by application of 6t/ha rate. The interaction effect between manure source and rates differed significantly at 3, 6 and 9 WAS in both planting season. The number of fresh fruits per plant as affected by varying rate of goat dung and poultry dropping shown in Table 5. The result showed that poultry dropping produced 13.56 and 13.95 fruit in 2010 and 2011 respectively while goat dung produced 11.79 and 12.26 fruits per plant in 2010 and 2011 respectively. The same trend happened in length and circumference of fresh fruits. The application of poultry dropping produced longer and widest fruits 16.40 and 22.62cm in 2010, 16.16 and 22.01cm in 2011. The application of goat dung produced fruit size of 15.68 and 22.37cm in 2010 and 12.30 and 21.59cm of length and circumference respectively in 2011. Application of poultry dropping in both planting seasons had little edge over goat dung in fresh fruit yield (t/ha). Poultry dropping produced 7.66 and 7.73t/ha of fresh cucumber in 2010 respectively while application of goat dung produced 6.81 and 6.82t/ha of fresh fruits in 2010 and 2011 respectively. The result of statistical analysis showed no significant difference ($p<0.05$) between goat dung and poultry dropping application in all the considered yield and yield components in both planting seasons. The result revealed significant ($p<0.05$) increase in yield and yield components with increase in both organic manure rates in 2010 and 2011 respectively. Application of 8t/ha rate of goat

and poultry manure performed best in all the yield parameters, followed application of 6t/ha rate irrespective of manure source. The application of 8t/ha of poultry dropping produced 11.25 and 11.29t/ha of fresh fruits in 2010 and 2011 respectively and 9.53 and 9.69t/ha of fresh fruit from goat dung in 2010 and 2011 respectively. The control produced the poorest yield in both planting season.

DISCUSSION

The result of soil analysis (Table 1) showed that the soil is a sandy clay loam. It is also noted that the soil has low pH which means that it is acidic. From the recommendations of Ibedu *et al.* (1988), the soil is also low in total nitrogen, organic matter content, and individual K. This implies low soil fertility. The significant effects of both organic manure (goat dung and poultry dropping) application had over control treatment may be attributed to the low soil fertility of the experimental site. This was evidence in result of the soil analysis. Tisdale and Nelson, (1975); Ndaeyo *et al.* (2005); Ogbonna (2008) noted that crop response to fertilizer application is affected by nutrient reserve in the soil. According to them, crops respond more to fertilizer application in soil with very low nutrient content than soil with high nutrient reserve. Organic fertilizers apart from releasing nutrient elements to the soil has also been shown to improve other soil chemical and physical properties which enhance crop growth and development (Mbagwu and Ekwealor, 1990). In addition, organic manure has also been reported to increase soil pH (Ullah *et al.* 2008), hence the acidic soil of the experimental site which might have caused the unavailability of nutrient element to the crops was checked by the liming potential of organic manure.

The result of this study showed significant increase in growth and yield attributes of cucumber with increase in the rate of goat dung and poultry dropping application. Lawal (2000); Agba and Enya (2005); Eifediyi and Remison (2009) had all reported increase in growth and yield components of cucumber to applied fertilizer. The application of fertilizer would led to better utilization of carbon and subsequent synthesis of assimilates (Lawal, 2000; Eifediyi and Remison, 2009). The little edge poultry dropping had over goat dropping growth and yield parameters considered could be as a result of nitrogen content of poultry dropping. This was in agreement with Ewulo (2005) that poultry dropping contains high percentage of nitrogen and phosphorus for the healthy growth of plant. The superiority and richness of poultry dropping over other manures has been confirmed in many experiments (De-Lannoy and Romain, 2001). Maynard (1991) reported that the yield of each of the nine crops (except lettuce) fertilized with 5t/ha poultry dropping was equal to or greater than those obtained with inorganic fertilizer.

Table 1a: Soil Physico-chemical properties of the experiment site before planting

Parameters	**Soil Depth**			
	0-15cm		**15-30cm**	
	2010	2011	2010	2011
Total N (%)	0.60	0.12	5.50	0.04
Organic Matter (%)	2.25	2.10	2.01	1.98
Available P ($mgkg^{-1}$)	74.33	41.81	50.38	48.35
K	0.07	0.11	0.05	0.08
Ca	2.56	2.90	2.35	2.15
Mg	1.60	4.10	1.10	8.90
Na	0.05	0.20	0.04	0.09
Exchange acidity	2.85	4.66	2.83	4.11
Bulk density (gcm^{-3})	1.20	1.30	1.45	1.54
pH (1:1) H_2O	5.40	5.50	5.30	5.20

Sand	86.40	90.20	78.80	88.30
Silt	4.60	3.30	8.00	5.60
Clay	9.00	6.50	13.20	6.10
Electrical Conductivity	0.05	0.06	0.04	0.05
ECEC	6.66	13.21	6.38	17.42
Base Saturation %	54.44	63.20	52.55	78.21

Table 1b: Chemical composition of organic Manure

Properties	2010		2011	
	Poultry Dropping		Goat Dung	
Nitrogen (%)	4.71	4.82	4.40	4.25
Phosphorus (%)	0.39	0.42	0.24	0.26
Potassium (%)	0.81	0.83	0.77	0.71
Calcium	0.05	0.03	0.36	0.38
Magnesium (kg)	0.25	0.28	0.30	0.32
Sodium	0.37	0.36	0.35	0.33
Organic Carbon	49.20	50.11	58.30	57.40

Table 2: Vine Length as influenced by organic manure source and rates

Organic Manure Source	**Organic Manure Rates (t/ha)**	**2010**			**2011**		
		3	6	9	3	6	9
Goat dung	0	16.85	29.41	69.37	17.33	30.01	72.18
	2	19.33	57.11	112.51	19.43	61.75	201.60
	4	20.33	65.33	184.30	21.25	66.70	216.00
	6	24.13	72.18	207.33	23.70	70.43	227.33
	8	25.33	74.25	216.70	24.30	76.33	231.60
	Mean	**20.19**	**59.66**	**158.04**	**21.20**	**61.04**	**189.74**
Poultry dropping	0	16.79	28.58	70.33	16.35	29.61	71.50
	2	20.45	58.30	128.61	20.10	66.25	217.60
	4	22.18	68.30	198.61	25.31	73.13	253.11
	6	28.31	77.36	226.71	31.63	82.70	274.10
	8	28.43	89.35	232.33	32.33	87.31	283.40
	Mean	**23.23**	**64.38**	**171.34**	**25.14**	**67.84**	**219.94**
LSD ($p<0.05$)							
Organic Manure		ns	ns	3.43	ns	ns	5.06
Rates of organic		2.10	5.67	11.34	4.93	7.03	24.31
Interaction		ns	ns	1.61	ns	ns	2.63

ns = Not significant.

Table 3: Number of Leaves per plant as influenced by organic manure source and rates

Organic Manure Source	**Organic Manure Rates (t/ha)**	**2010**			**2011**		
		3	6	9	3	6	9
	0	4.13	10.51	15.60	5.01	12.60	15.60
	2	5.13	15.50	26.90	5.25	17.60	25.30
Goat dung	4	5.13	19.25	31.18	5.38	21.08	33.25
	6	5.18	22.80	36.20	6.02	23.40	39.20
	8	5.21	23.10	38.04	6.13	24.13	42.50
	Mean	**4.95**	**18.23**	**29.58**	**5.56**	**19.36**	**31.17**
	0	4.20	10.60	15.30	5.35	12.63	17.60
	2	5.18	18.70	27.35	5.35	21.80	28.33
	4	5.18	22.50	32.40	6.25	24.33	34.50
Poultry dropping	6	5.20	23.81	39.18	6.30	25.06	39.30
	8	5.20	24.30	42.20	6.39	26.37	45.64
	Mean	**4.99**	**19.98**	**31.28**	**5.92**	**22.04**	**33.08**
LSD ($p<0.05$)							
Manure types (A)		ns	ns	ns	ns	ns	ns
Rates of organic (B)		ns	3.11	11.20	ns	4.07	13.17
Interaction of AxB		ns	ns	ns	ns	ns	ns

ns = Not significant.

Table 4: Leaf Area (cm^2) of cucumber as influenced by organic manure source and rates

Organic Manure Source	**Organic Manure Rates (t/ha)**	**2010**			**2011**		
		3	**6**	**9**	**3**	**6**	**9**
	0	763.10	2101.08	2211.61	761.18	2136.11	2309.30
	2	893.33	3208.11	3839.80	812.18	3318.21	4104.11
Goat dung	4	992.80	3519.30	3948.20	1087.31	3630.10	4236.21
	6	1089.30	4022.20	4502.13	1209.40	3998.16	4736.21
	8	1186.33	4121.16	4780.20	1213.50	4186.17	4812.10
	Mean	**984.91**	**3394.37**	**3856.39**	**1016.71**	**3453.75**	**4039.59**
	0	756.14	2116.10	2261.07	758.40	2202.10	2298.30
	2	929.70	3361.80	3942.18	893.43	3419.33	4263.13
	4	1089.51	3893.18	4210.60	1033.80	3887.80	4556.10
Poultry dropping	6	1341.20	4261.33	4862.18	1262.13	4282.33	4881.20
	8	1399.40	4371.08	4988.99	1298.02	4399.30	4991.25
	Mean	**1103.19**	**3600.70**	**4053.00**	**1049.16**	**3638.17**	**4198.60**
LSD ($p<0.05$)							
Manure types (A)		78.33	81.22	53.60	ns	24.60	29.94
Rates of organic (B)		83.60	107.61	118.07	77.10	76.13	105.60
Interaction of AxB		21.10	26.07	16.33	ns	11.03	17.14

ns = not significant difference.

Table 5: Yield and yield components of cucumber as influenced by organic manure source and rates

		2010				**2011**			
Organic Manure Source	**Organic Manure Rates (t/ha)**	No. of fruits/plant	Length of fruits(cm)	Circumf. of fruit(cm)	Fresh fruit yield(t/ha)	No. of fruits/plant	Length of fruits(cm)	Circumf. of fruit(cm)	Fresh fruit yield(t/ha
	0	5.10	10.60	19.60	3.34	4.75	10.10	18.25	3.41
Goat dung	2	8.33	13.33	22.10	5.10	8.75	13.25	20.40	5.25
	4	12.80	16.40	22.50	7.21	11.81	15.75	21.58	7.26
	6	15.30	18.30	23.70	8.85	16.25	18.40	23.80	8.49
	8	17.40	19.75	23.95	9.53	19.75	18.75	23.92	9.69
	Mean	**11.79**	**15.68**	**22.37**	**6.81**	**12.26**	**12.30**	**21.59**	**6.82**
	0	5.30	10.35	19.39	3.45	5.00	10.73	17.63	3.44
	2	9.30	13.75	22.59	5.52	9.75	13.60	21.60	5.60
Poultry	4	13.60	18.30	23.30	8.75	14.30	17.59	23.11	8.78
Dropping	6	19.30	19.80	33.75	9.35	20.33	19.25	23.80	9.55
	8	20.30	19.82	24.05	11.25	26.35	19.62	23.93	11.29
	Mean	**13.56**	**16.40**	**22.62**	**7.66**	**13.95**	**16.16**	**22.01**	**7.73**
LSD ($p<0.05$)									
Manure types (A)		ns	ns	ns	ns	ns	ns	ns	ns
Rates of organic (B)		2.25	2.75	1.03	1.89	2.16	2.08	1.77	2.11
Interaction of AxB		ns	ns	ns	ns	ns	ns	ns	ns

CONCLUSION

From the result generally, the study suggest that application of poultry manure and goat dung improves the growth and yield of cucumber. From the above it can be suggested to farmers in Uyo to use up to 8t/ha of poultry manure in cucumber production. Also there is global trend towards organic farming, reducing environmental pollution, waste recycling and poverty alleviation. The use of poultry manure and goat dung as alternative sources of soil nutrients can assist to achieve this objective.

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